WHAT IS CLAIMED IS:

1. A process for making a cross-directionally worked molybdenum plate, the process comprising:

(a) reducing ammonium molybdate and forming molybdenum metal powder;

(b) consolidating a molybdenum component comprised of molybdenum metal powder and an alloying element to a first workpiece, the alloying element being selected from the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof;

(c) thermally treating the first workpiece and subjecting the workpiece to thermo-mechanical forces in a first direction, and thereby forming a second workpiece;

(d) thermally treating the second workpiece and subjecting the second workpiece to thermo-mechanical forces in a second direction that is different from the first direction;

(e) subjecting the thermomechanically treated second workpiece to a recrystallization heat treatment step, and thereby forming a heat-treated crossdirectionally worked workpiece; and

(f) subjecting the heat-treated, cross-directionally worked workpiece to a slicing step or a machining step, and thereby forming the cross-directionally worked molybdenum plate.

2. The process of Claim 1, wherein the first workpiece further comprises niobium in an amount that is less than about 3 wt.%.

3. The process of Claim 1, wherein the first workpiece further comprises tungsten in an amount ranging from about 1 to about 30 wt.%.

4. The process of Claim 1, wherein the molybdenum component is consolidated into the first workpiece by a powder metallurgical technique.

5. The process of Claim 1, wherein the molybdenum component is consolidated into the first workpiece by an arc casting technique.

6. The process of Claim 5, wherein the arc casting technique is a vacuum arc casting technique.

7. The process of Claim 1, wherein the first workpiece is a billet or an ingot and the first workpiece is thermo-mechanically treated by extruding the billet or the ingot to a ratio of reduction (D_o:D_f) in a cross-sectional area ranging from about 3:1 through about 4:1.

8. The process of Claim 1, wherein in step (d), the second workpiece is subjected to upset forging.

9. The process of Claim 8, wherein second workpiece is upset forged by a closed die forging process with a closed die that is dimensioned to form a plate.

10. The process of Claim 8, wherein second workpiece is upset forged by an open die forging process with an open die that is dimensioned to form a plate.

11. The process of Claim 9, wherein in step (d), the closed die is further dimensioned to include a mold for a stem so that the plate formed by the process in step (e) further comprises a stem.

12. A member made by the process of Claim 11, wherein the member comprises a plate and a stem attached to the plate.

13. A plate made from the process of Claim 1, wherein the plate is a cross-directionally worked plate having a uniform grain structure.

14. The process of Claim 1, wherein the alloying element is present in an amount that is about 1.2 wt. %, or less.

15. The process of Claim 1, wherein the alloying element is present in an amount ranging from about 1 wt.% to about 1.5 wt.%.

16. The process of Claim 1, wherein the plate has a diameter ranging from about 1" to about 14" and a thickness/height ranging from about 1/4" to about 7".

17. The process of Claim 1, wherein the plate made by the process has a radial strength of at least about 60 ksi when the plate is exposed to a temperature of about 1600°C.

18. The process of Claim 1, wherein the alloying element comprises lanthanum oxide, and the plate made by the process has improved creep resistance, as compared to a plate made without lanthanum oxide.

19. A plate comprising a cross-directionally worked molybdenum component selected from the group consisting of (i) a molybdenum component containing molybdenum and an alloying element selected from the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof or (ii) a molybdenum component comprising molybdenum, niobium and an alloying element selected from the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof or (iii) a molybdenum component comprising molybdenum, tungsten in an amount ranging from about 1 to about 30 wt.% and an alloying element selected from the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof;

wherein the plate has a radial strength of at least about 60 ksi when the plate is exposed to a temperature of about 1600°C.

20. The plate of Claim 19, wherein the plate further comprises a stem.

21. An X-ray target comprising:

(a) a plate comprising a cross-directionally worked molybdenum component selected from the group consisting of (i) a molybdenum component containing molybdenum and an alloying element selected from

the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof or (ii) a molybdenum component comprising molybdenum, niobium and an alloying element selected from the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof or (iii) a molybdenum component comprising molybdenum, tungsten in an amount ranging from about 1 to about 30 wt.% and an alloying element selected from the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof;

wherein the plate has a radial strength of at least about 60 ksi when the plate is exposed to a temperature of about 1600°C;

(b) a focal track located on a surface of the plate; and

(c) a stem extending from the plate.

22. The target of Claim 21, wherein the stem comprises a worked molybdenum component selected from the group consisting of (i) a molybdenum component containing molybdenum and an alloying element selected from the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof or (ii) a molybdenum component comprising molybdenum, niobium and an alloying element selected from the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof or (iii) a molybdenum component comprising molybdenum, tungsten in an amount ranging from about 1 to about 30 wt.% and an alloying element selected from the group consisting of titanium, zirconium, hafnium, carbon, lanthanum oxide, and combinations thereof,

wherein the stem also has a strength of at least about 60 ksi when the stem is exposed to a temperature of about 1600°C.